



Simulating climate change-induced alterations in bioaccumulation of organic contaminants in an Arctic marine food web

Author(s): Borga K, Saloranta TM, Ruus A
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Abstract:

Climate change is expected to alter environmental distribution of contaminants and their bioaccumulation due to changes in transport, partitioning, carbon pathways, and bioaccumulation process rates. Magnitude and direction of these changes and resulting overall bioaccumulation in food webs is currently not known. The present study investigates and quantifies the effect of climate change in terms of increased temperature and primary production (i.e., concentrations of particulate organic carbon, C(POC)), on bioaccumulation of organic contaminants in biota at various trophic levels. The present study covers only parts of the contaminant behavior that is influenced by climate change, and it was assumed that there were no changes in food web structure and in total air and water concentrations of organic contaminants. Therefore, other climate change-induced effects on net bioaccumulation, such as altered contaminant transport and food web structure, should be addressed in future studies. To determine the effect of climate change, a bioaccumulation model was used on the pelagic marine food web of the Arctic, where climate change is expected to occur fastest and to the largest magnitude. The effect of climate change on model parameters and processes, and on net bioaccumulation, were quantified for three modeling substances (gamma-hexachlorocyclohexane [HCH], polychlorinated biphenyl [PCB]-52, and PCB-153) for two possible climate scenarios. In conclusion, increased temperature and C(POC) reduced the overall bioaccumulation of organic contaminants in the Arctic marine food web, with the largest change being for PCB-52 and PCB-153. Reduced bioavailability, due to increased C(POC), was the most influential parameter for the less water soluble compounds. Increase in temperature resulted in an overall reduction in net bioaccumulation.

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Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Special Report on Emissions Scenarios (SRES)

Special Report on Emissions Scenarios (SRES) Scenario: SRES B2

Communication:

resource focus on research or methods on how to communicate or frame issues on climate change;
 surveys of attitudes, knowledge, beliefs about climate change

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Communication Audience:

audience to whom the resource is directed

Researcher

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Food/Water Quality, Temperature

Food/Water Quality: Chemical

Geographic Feature:

resource focuses on specific type of geography

Arctic

Geographic Location:

resource focuses on specific location

Global or Unspecified

Health Impact:

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology:

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Long-Term (>50 years)

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

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